

YUBA PRMS

FY08-FY12

Teams

USGS

- Kate Koczot (project chief)
- Donna Knifong
- Chris Farrar

COOPERATOR

- DWR (Cooperator)
- Supporting/Interested Agencies
 - PG&E
 - YCWA
 - NID
 - USACE
 - SFWP

Presentation Outline

Yuba Precipitation-Runoff Modeling System

- PRMS model
- Yuba Watershed
- The model development process
- Some photos of the area/example features
- Project plans and status
- References for model documentation

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PRMS Model

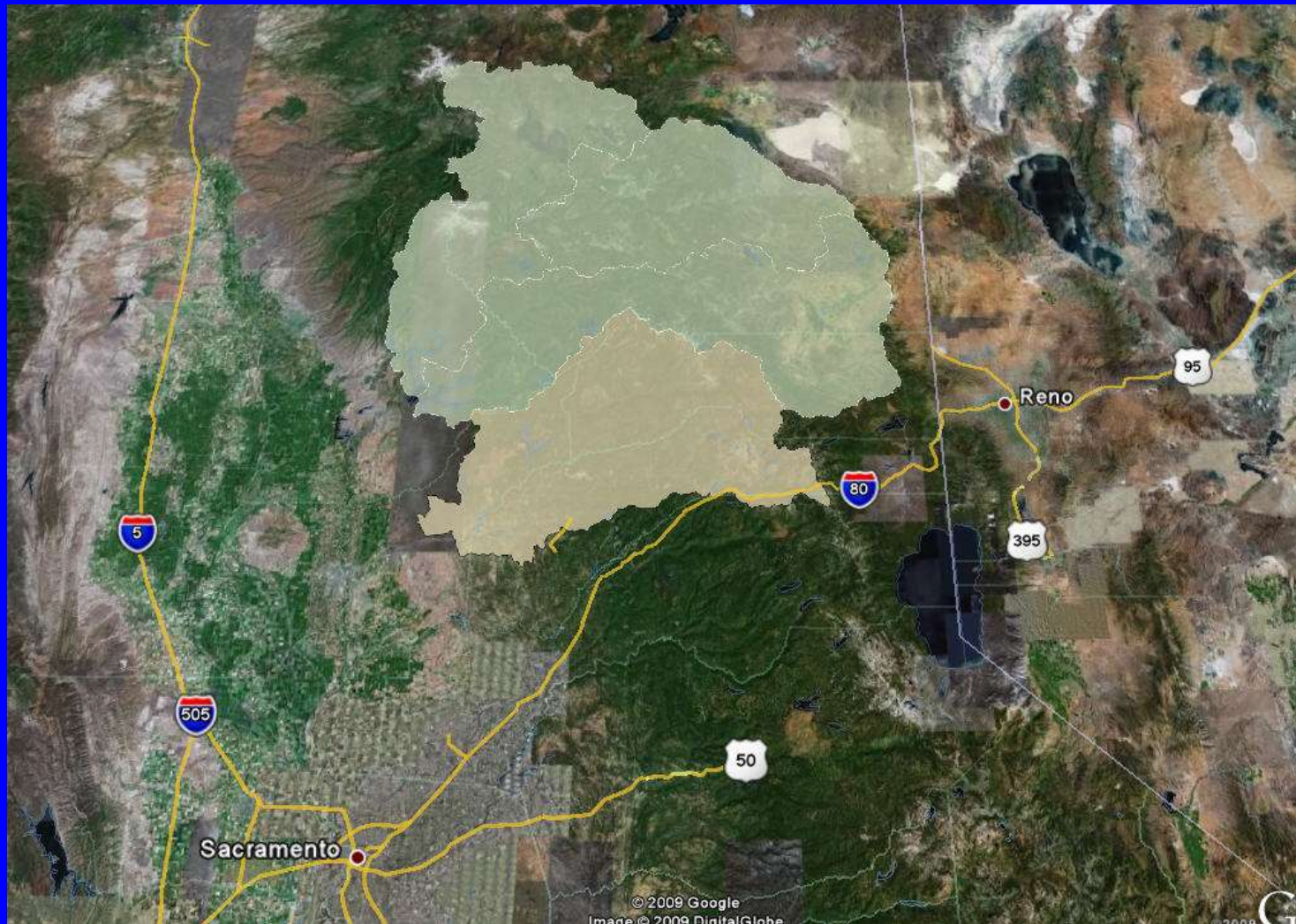
Precipitation-Runoff Modeling System PRMS

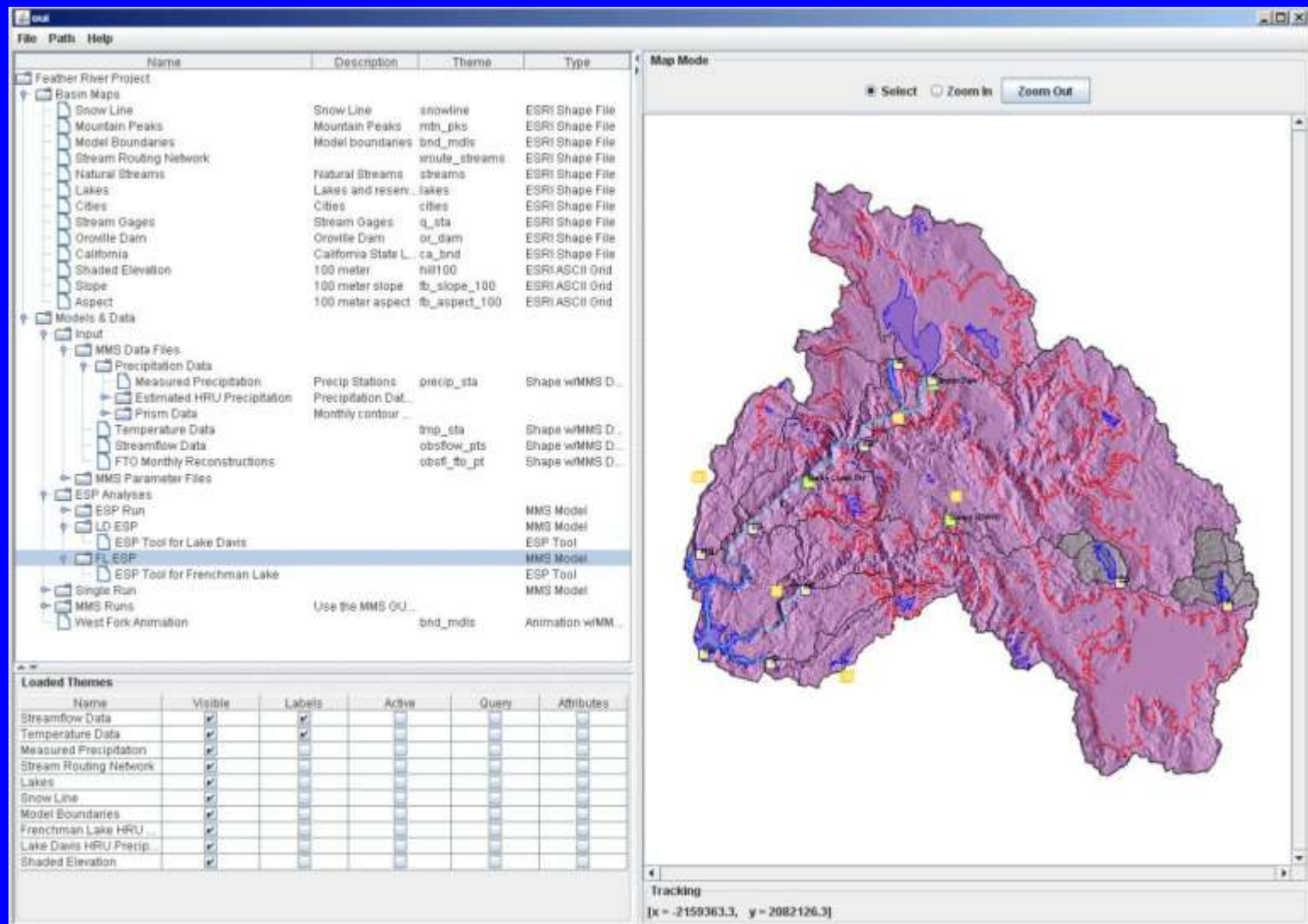
PRMS is a modular, deterministic, distributed-parameter modeling system developed to evaluate the impacts of various combinations of precipitation, climate, and land use on streamflow, sediment yields, and general basin hydrology.

Originally developed in the by George Leavesly *et al.* it's Fortran based programming was developed for punch card based computing systems.

Two GIS/User interface systems were developed for personal/mainframe computing systems Modular Modeling System (MMS) and Object User Interface (OUI)

Yuba Watershed





Feather PRMS OUI (+DL and FL)
(PRMS, Basin Routing, ESP)

- Sierra Nevada

- 1360 square miles

- Elevation range
80-8800 feet

- 69% of basin
below 5500
snowline

**SIGNIFICANCE
TO CA DWR:**

- Feather-Yuba
Coop O.P.

- Hydropower
- Flooding Impacts

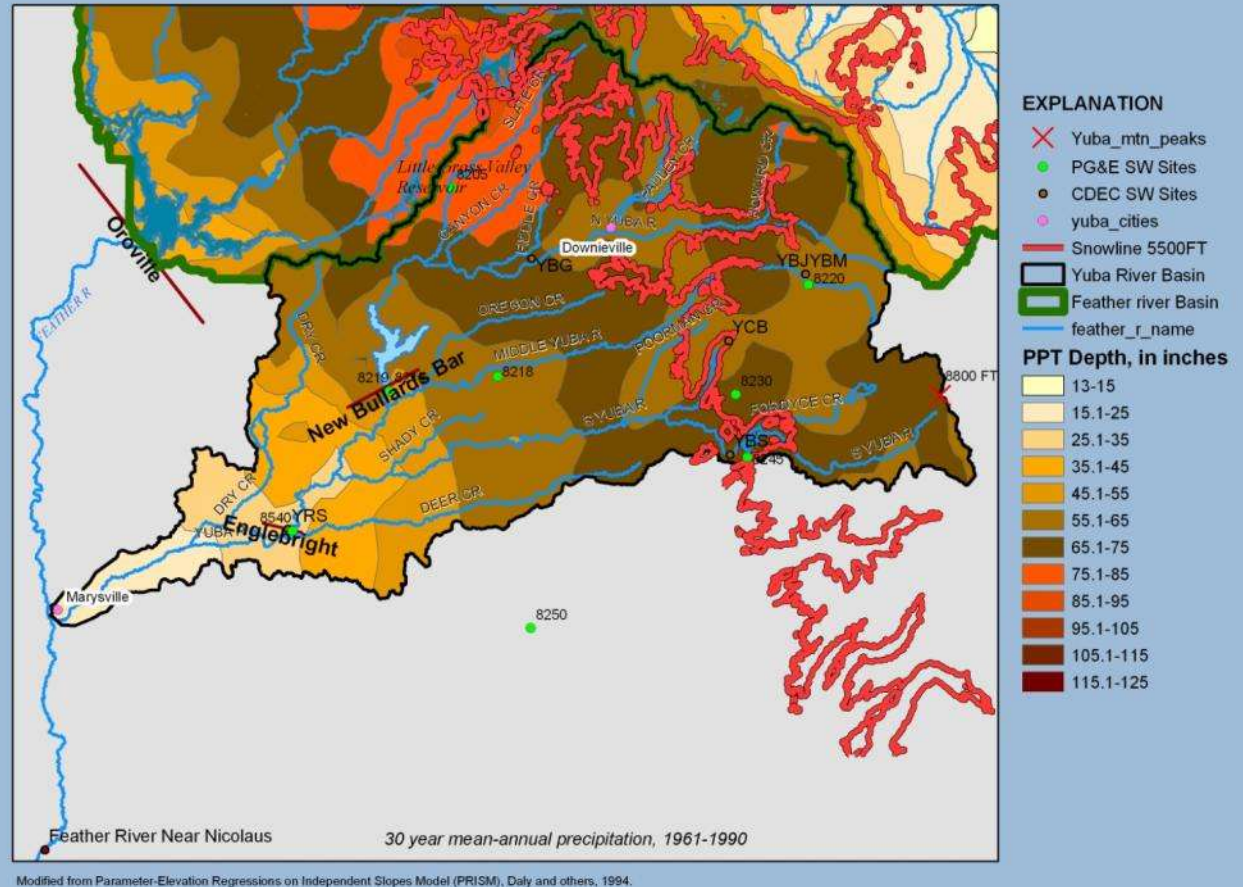
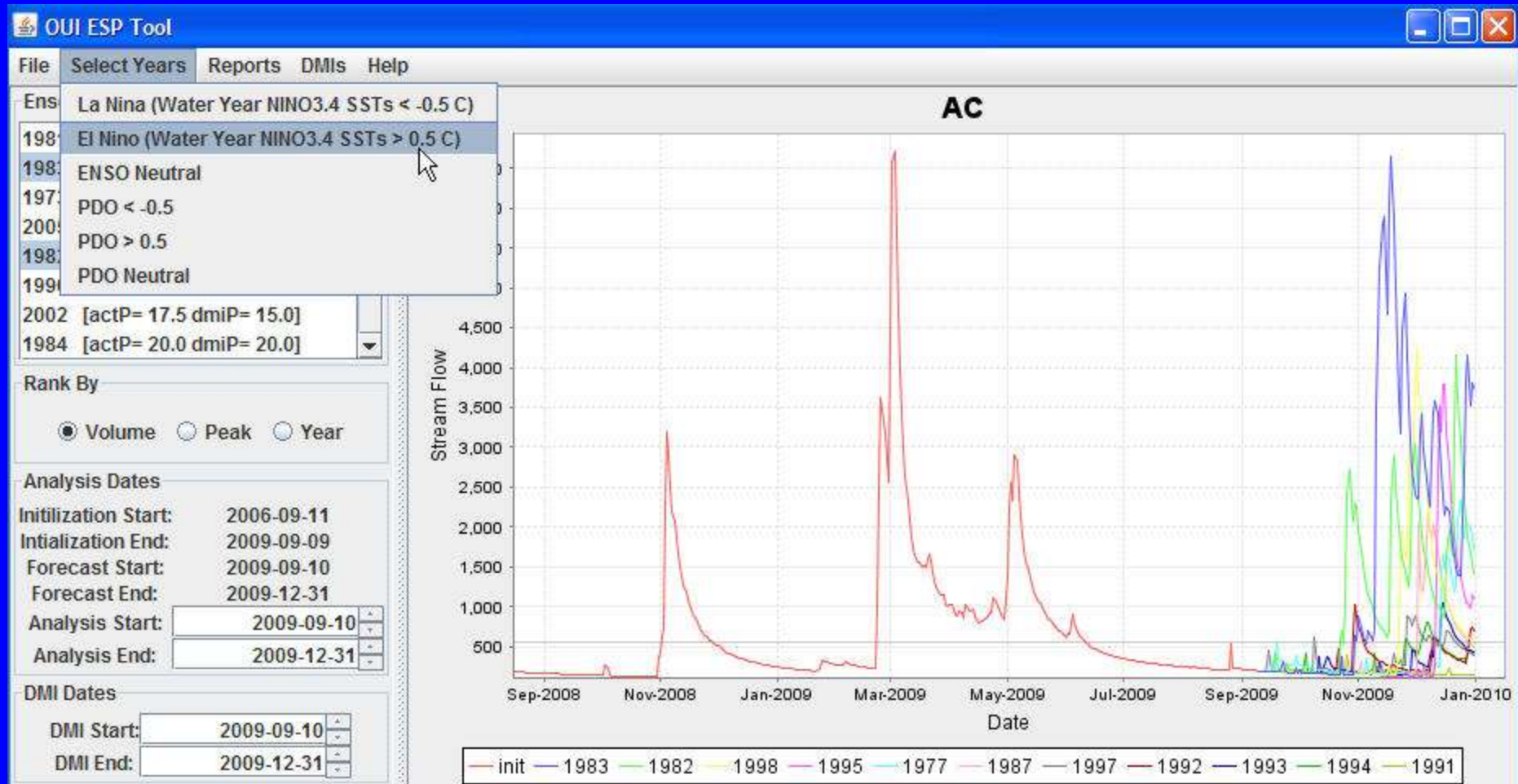


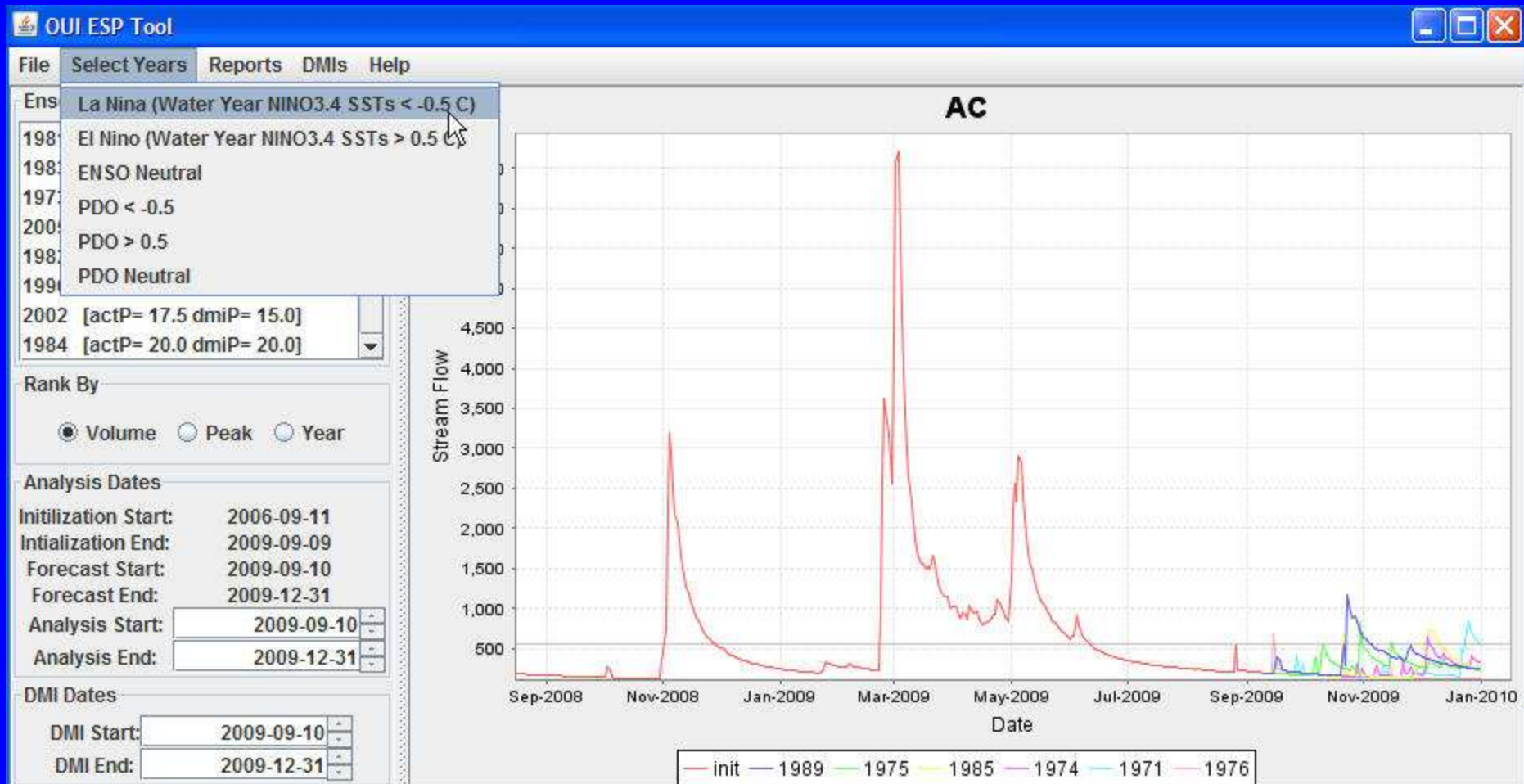
Figure 1. Yuba River Basin

Yuba River PRMS

Ensemble Streamflow Prediction

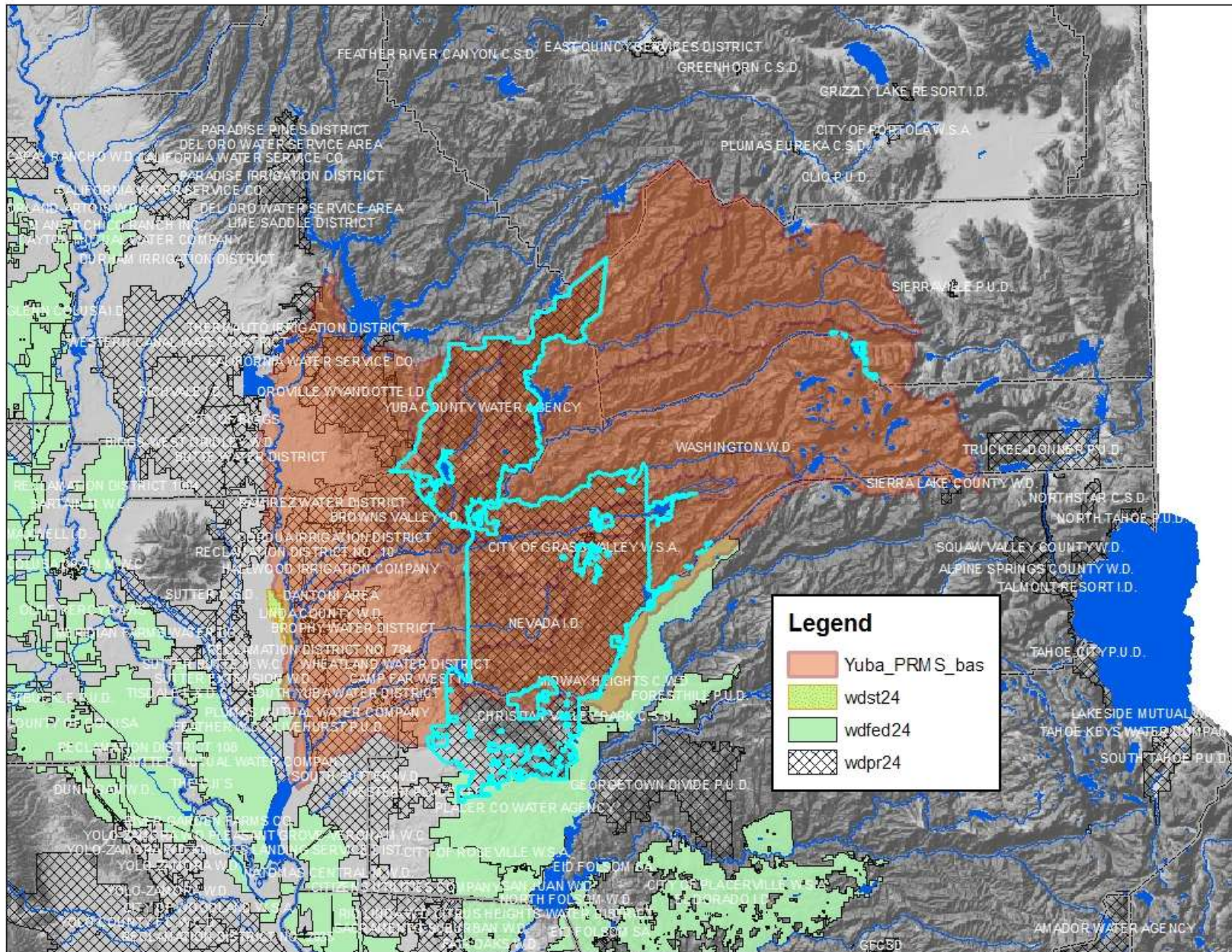


Ensemble Streamflow Prediction

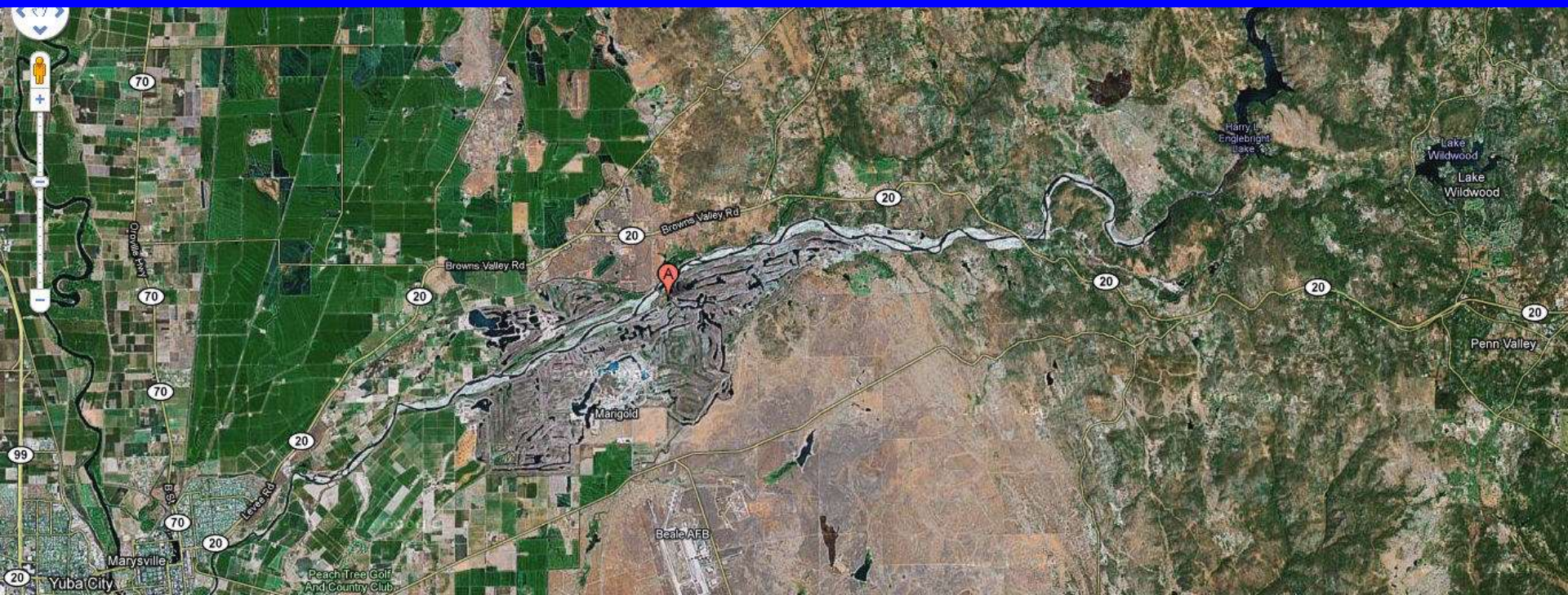


(proprietary, do not release)

Yuba Basin Water Districts









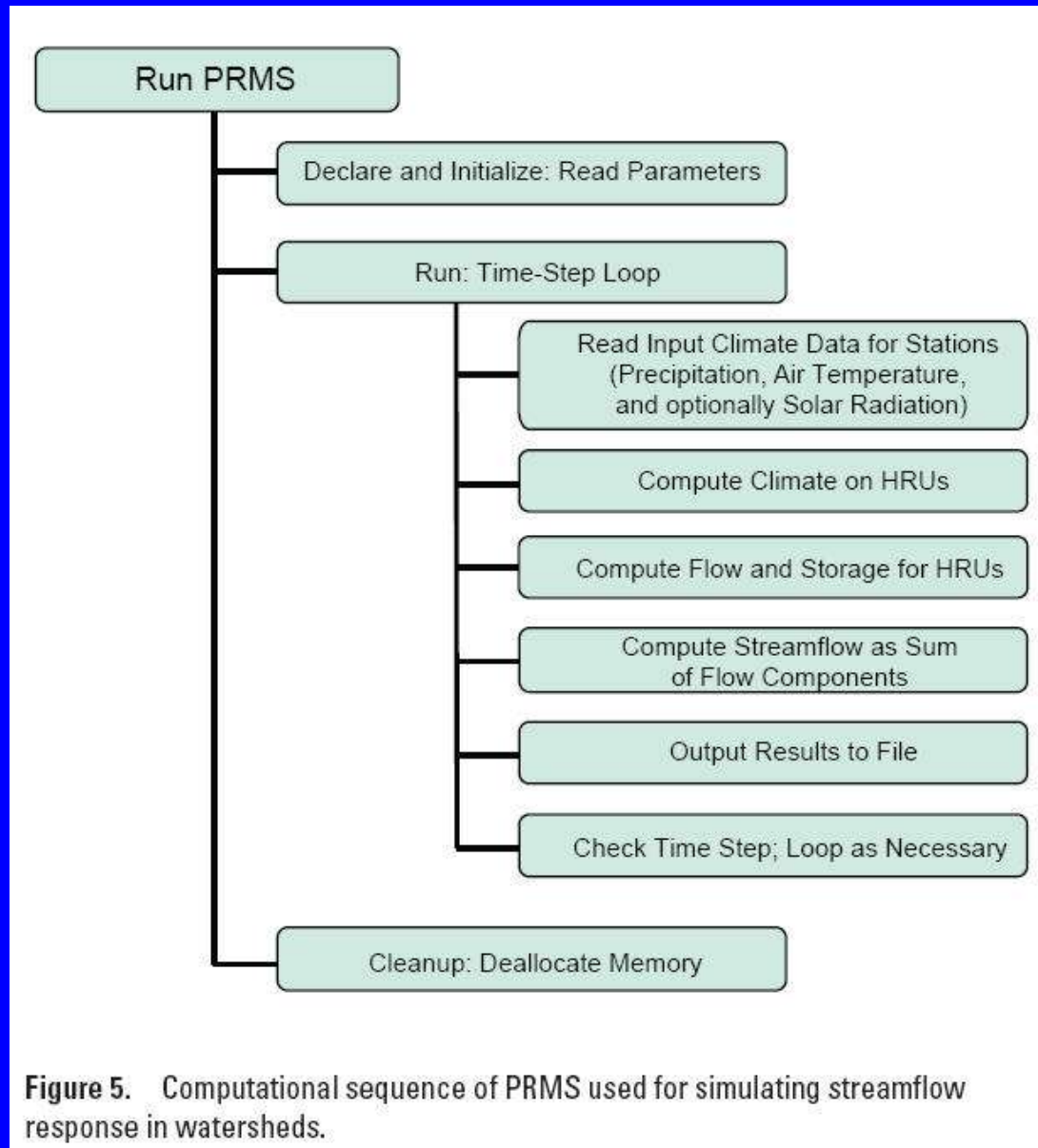


ID_NO	Model_ID	Model name	Node name	LocalID	FNFlcalID	FNFOtherID
1			Slate Creek @ Diversion Dam (outflow, no gage here)	NY901	NY901	8205
2	GB	Goodyears Bar	Yuba NF below Goodyears Bar	YBG		
3			North Yuba below Bullards Bar Dam (YCWA)= (outflow, NY23)	NY904T	NY904T	8215?
4			North Yuba below Bullards Bar Dam (YCWA)= (outflow, NY23, nc NY901)	NY904	NY904	8219-8205?
5			Oregon Creek @ Log Cabin diversion (below) (NY19)	NY902	NY902	8210
		Jackson				
6	JM	Meadows	Mid Yuba @ 11-4079 blw Jackson Meadows Dam (NID'S)	YB901	YB901	8220
7			Mid Yuba blw Hour House Dam, excluding above Jackson Mdws Dam, NY18	NY903	NY903	8218
8	BL	Bowman Lake	Canyon Creek, below Bowman Lake	YB902	YB902	8230
9			S Yuba at Lake Fordyce	YB902B	YB902B	8240
10			Texas-Fall Creek system	YB902A	YB902A	8235
		South Yuba,				
11	SY	Langs Crossing	Langs Crossing/S Yuba @ Lake Spaulding incl. Fordyce and above (YB29)	YB903	YB903	8245
12			S Yuba @ Lake Spaulding w/out Fordyce and above (YB29)	YB903A	YB903A	
13			S YUBA R A JONES BAR NR GRASS VALLEY CA	11417500		
14			Yuba River below Englebright Dam (aka YRS, NY28)	NY	NY	8540
15_old	old eq.	old eq.	Narrows subbasin = 8540-(8215+8210+8220+8218+8230*1.25+8245)	NY905	NY905	
15	new eq.	new eq.	Narrows subbasin = 8540-(8205+8219+8210+8220+8218+8230+8235+8245)	NY905	NY905	
16			Scotts Flat Inflow (Deer Creek)	SFL_inflow	SFL_inflow	
17			Deer Ck near Smartville	DCS		
18	YR	Yuba River	Yuba River @ Deer Ck confluence near Smartville (FNF = NY(akaYRS)+DCS)	YRS-M	YRS-M	
19			Yuba at Marysville	MRY		
20	HC	Honcut Creek	South Honcut Creek Near Bangor	SFH	SFH	
21	DC	Dry Creek	DRY C NR BROWNS VALLEY CA	11420700		
22			DRY C A VIRGINIA RANCH CA	11420500		
23			DRY C NR BROWNSVILLE CA	11420000		

Data Requirements

- For daily streamflow computations, a minimum of *daily precip* and *daily max and min air temp* are required.
- For snowmelt computations, daily short-wave solar radiation data are recommended.
- For areas without snowmelt, daily pan evaporation data can be substituted for temperature data.
- For storm hydrograph and sediment computations, short time-interval precipitation, streamflow, and sediment data are needed.
- Physical descriptive data on the topography, soils, and vegetation are input for each watershed subunit.
- The spatial and temporal variation of precipitation, temperature and solar radiation are also needed.

PRMS Computational Sequence

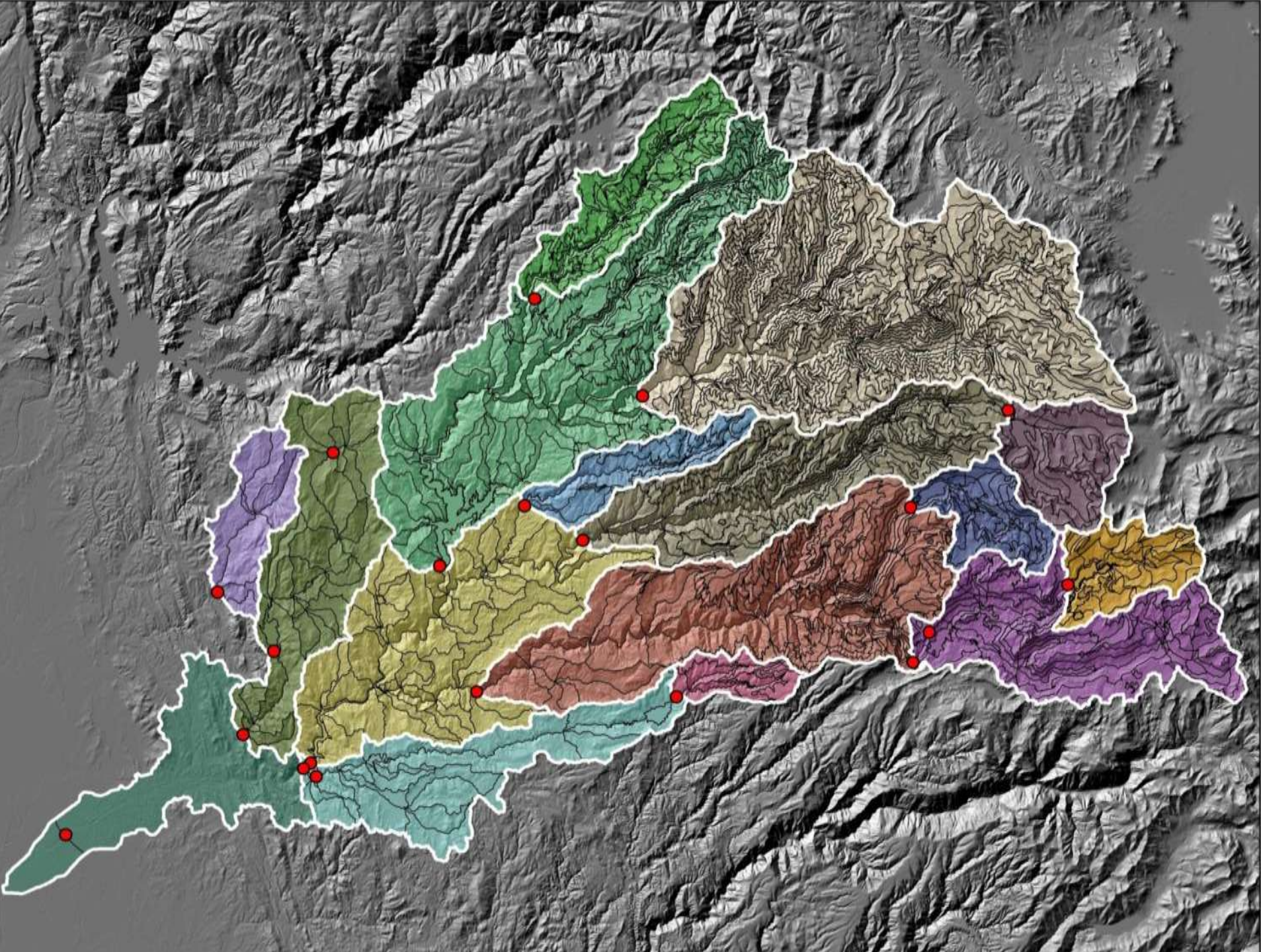


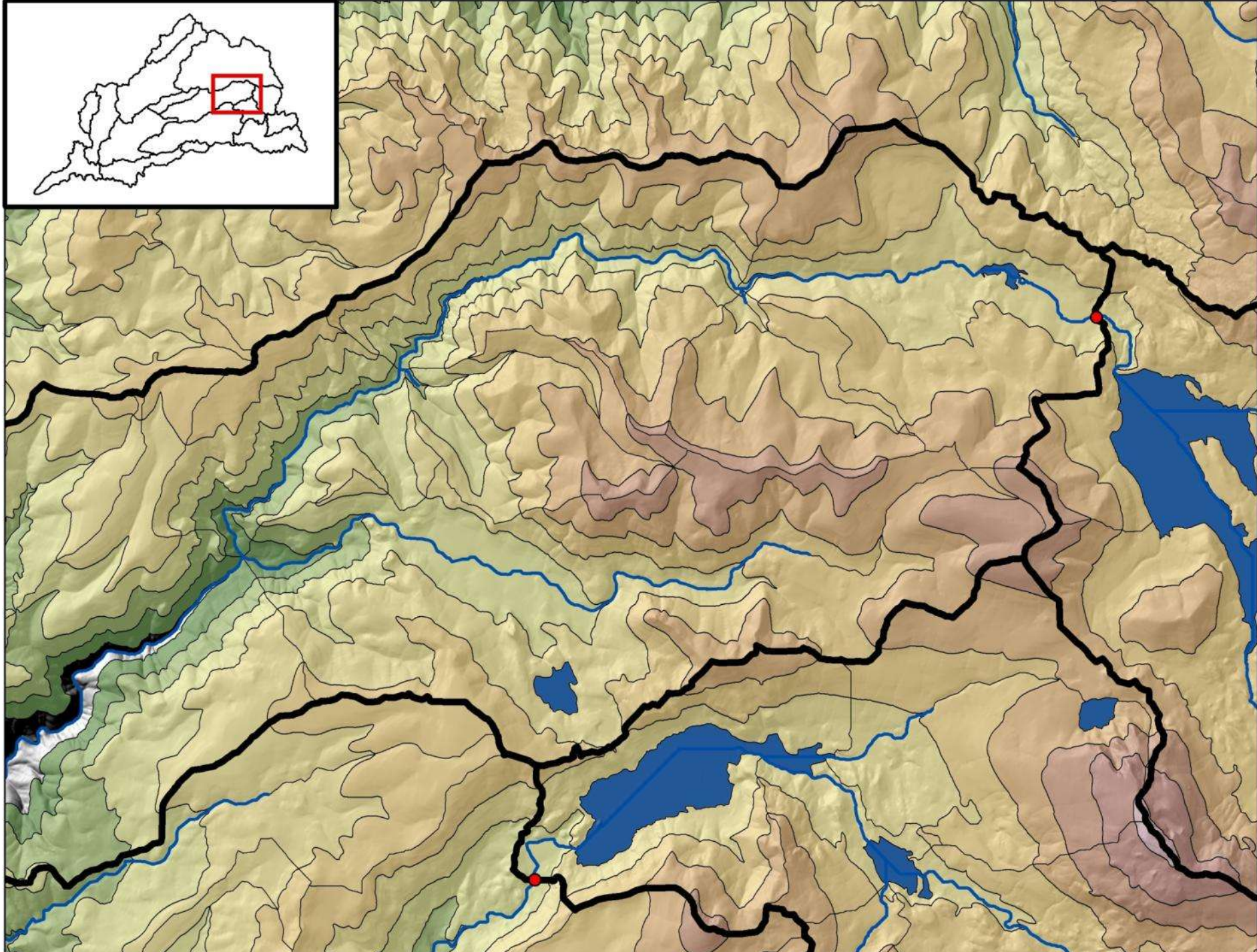
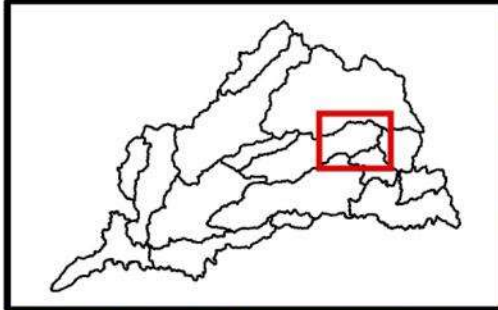
OBJECTIVES

- 1) Construct PRMS and OUI for drainages in the Yuba River Basin above Marysville.
- 2) Characterize and simulate daily precipitation, temperature, snowpack evolution, runoff, and water and energy balances that determine streamflow rates from, and within, the Yuba River Basin above Marysville.
- 3) Assess the effects of climate variations (historical and future) in the Yuba basin and its impacts on streamflow.
- 4) Assist DWR in using the Yuba PRMS and OUI as an operational management tool.

DWR Uses for PRMS

- 1. Seasonal Forecasting (April-July Runoff) – useful for water supply and reservoir operations**
- 2. Snow Melt Forecast (20-day outlook) – useful for reservoir operations and spring flood management**
- 3. Flood Forecasting (5-day outlook) – useful for precipitation driven flood management**





Yuba Status

- Regular meetings with cooperator.
- GIS development ongoing.
- Field visits to Yuba River watershed.
- Yuba PRMS model development.
- FNF's and climate data soon to be ready.





Yuba: Next

- Complete Model Construction:
 - PRMS for GSFLOW
- Do Climate Change Analysis.
- Build OUI (+DMI).
- Report writing ongoing (SIR, Journal article(s)).

END SHOW

References for PRMS Model

1. Leavesley, G.H., Litchy, R.W., Troutman, M.M., and Saindon, L.G., 1983, Precipitation-runoff modeling system--User's manual: U.S. Geological Survey Water-Resources Investigations Report 83-4238, 207 p.
2. Leavesley, G.H., Restrepo, P.J., Markstrom, S.L., Dixon, M., and Stannard, L.G., 1996, The Modular Modeling System (MMS): User's Manual, U.S. Geological Survey Open-File Report 96-151, 175 p.
3. Koczot, K.M., Jeton, A.E., McGurk, B.J., and Dettinger, M.D., 2005, Precipitation-runoff processes in the Feather River Basin, northeastern California, with prospects for streamflow predictability, water years 1971-97: U.S. Geological Survey Scientific Investigations Report 2004-5202, 82 p.
4. Markstrom, S.L., Niswonger, R.G., Regan, R.S., Prudic, D.E., and Barlow, P.M., 2008, GSFLOW—Coupled ground-water and surface-water flow model based on the integration of the Precipitation-Runoff Modeling System (PRMS) and the Modular Ground-Water Flow Model (MODFLOW-2005): U.S. Geological Survey Techniques and Methods 6-D1, 240 p.